place, for the perfect could not die. But this much we know, that God made man, nor can we doubt the wisdom of his work. His infinite power is combined with infinite love and infinite wisdom. It is very evident that all things mortal, in the great æons of eternity, are so brief, that not what they are but what they lead to, is the question of importance. And surely, old Pine, we can all of us well have faith enough in God to trust Him that good, and good alone, will be the ultimate result of all His works."

"And sleep, Ellen?"

"Sleep," she said, "is a provision by which the body is enabled the longer to perform its work. The body is a complicated machine capable of doing many things. But it can do nothing except through the use of material. So that whether Ellen walks, or jumps, or works; laughs, or smiles, or weeps; thinks, or talks, or dreams; she does it by the use of material furnished by her body."

"And how much material does it take for a smile or for a dream?"

"Ellen doesn't know," she answered. "Just a tiny little bit for a smile. But when Ellen comes up this mountain to see the old Pine, she consumes an awful lot of material, as she can tell from her appetite when she gets back. The body, whether animal or plant, is born into the world with a very limited supply of the materials necessary for its activities. It just has to live from hand to mouth, old Pine, but it is able, under normal conditions, to supply itself with more as wanted."

"And how does it do this?"

"Through the operation of the digestive organs and the lungs," she replied. "From food and water the tissues of the body are replenished, and by respiration oxygen is supplied; for the air is composed in part of oxygen, nearly twenty-three and one-tenth parts oxygen, to seventy-six and nine-tenths of nitrogen by weight, with a trifle of other substances. Of this the blood gets such supply as it needs, yielding up, to be expelled by the lungs, carbonic acid received from the tissues."

"And what are the tissues?"

"The tissues are the fabric," she replied, "of which the organs of both animals and plants are composed."

"And are these the same?"

"They are similar," she said; "but tissues which are absent from plants occur in animals. These are called animal tissues, and relate to movement or sensation, as the muscles and nerves. Those of which plants are formed are called vegetable tissues, as are the corresponding ones in animals, as epithelium or bone. Physiology teaches that the animal is made up of osseous tissue, or bone; muscular tissue, or flesh; adipose tissue, or fat; cartilaginous tissue, or gristle; connective tissue to bind the whole together, and pigmentary tissue, or coloring matter."

"And of what are these tissues composed?"

"All plants and all animals," she replied, "are composed of organic and mineral or inorganic substances. The mineral substances exist in the crust of the earth, but the organic are primarily formed in the plant or animal from inorganic matter which they have absorbed. Plants are chiefly formed of these inorganic constituents, all of which contain carbon and hydrogen, some of them consisting entirely of these two elements; but the greater proportion also contain oxygen and nitrogen, and in minute quantities several other constituents.

"The inorganic constituents found in the ashes of all plants are, as the chemists tell us, potash, soda, magnesia and lime, in combination with phosphoric, sulphuric, hydrochloric and carbonic acids, and additionally iron, manganese, and silica, with traces of fluorine. Seaweeds contain also bromine and iodine. Other substances are occasionally found. Among the most essential of the inorganic constituents is water, sometimes amounting to from eighty-six to ninety-six per cent of the plant. It follows that the nutrition and development of plants depend on their absorbing carbon, hydrogen, nitrogen, and sulphur compounds, with water and such inorganic compounds as yield the necessary inorganic constituents, in a form capable of assimilation.

"In animals all the substances necessary for development and growth are furnished by the blood, which obtains them through digestion and respiration; for food and drink are prepared by the digestive organs, and enter the blood either directly or through the lymphatic system."

"And what is this lymphatic system?"

"Vessels which carry the lymp,—a colorless or faintly yellowish red fluid, very similar to blood but lacking the red corpuscles."

"And what is its use?"

"Two-fold, as again physiology teaches. First to convey from the tissues to the blood effete matter to be afterwards secreted by the skin, lungs, and kidneys; second, to supply new material for the formation of the blood. This lymphatic system also includes the lacteals, so called, which only differ from other lymphatic vessels in carrying chyle instead of lymph."

"And what is chyle?"

"It is a part of the matter evolved by the different processes of digestion. The food undergoes various changes after it enters the alimentary canal. First, in the stomach it is converted in a pulpy mass called chyme, which, passing into the small intestine, is acted upon by the bile, pancreatic fluid, and intestinal juice, and thus a portion of it is changed into the chyle, a milky-looking fluid, the chemical constituents of which are much the same as blood, which is absorbed or sucked up by the lacteals, and finally converted into pure blood."

"And what part does respiration perform?"

"Its great object is the furnishing of oxygen to the system and the carrying off of carbonic acid."

"And how does it do this?"

"Through the laws of chemical attraction. The air taken into the lungs is composed, as Ellen said, in part of oxygen. The lungs are divided into innumerable cells, the estimate being that there are six hundred millions of these in an adult person. The blood driven by the heart through the arteries, veins, and capillaries is distributed among these cells separated from the air only by a thin and moist membrane through which the laws of chemical attraction easily operate, by which the blood gets rid of its carbonic acid and takes in a new supply of oxygen."

"And where does the blood obtain its carbonic acid?"

"Picks it up in its course through the system, and is very glad to exchange it for a new supply of pure, fresh oxygen."

"But what becomes of this carbonic acid?"

"It is carried out into the atmosphere, where it is at once absorbed by vegetable life; all the trees and plants, which use the carbon for their tissues, giving back the oxygen. It is in this way that God has provided for the existence of different things in His great kingdom. Thus He builds up the animal world, and thus He builds up the vegetable world. And thus we see again how nature is a great circulatory worker; how the same material, never destroyed, is used over and over and over again, now sustaining life in the vegetable world, and now in the animal world."

"And how is the oxygen distributed to the tissues in every part of the body?"

"Also by the blood, which flows in every part in a perfect network of arteries, veins and capillaries. It distributes this oxygen, which at once goes into combustion with the carbon of the tissues, enabling the body to perform all its activities. Just isn't it a busy condition? And this is life—Ellen's life from day to day, and also the old Pine's life. The digestion from food and water furnishes to man the carbon, and what other inorganic substances are needed. The respiration furnishes the oxygen. Chemical combination evolves heat, which is so important in all the phenomena of life."

"But what is it, Ellen, which causes the circulation of the blood?"

"The organs of circulation, as physiology also teaches us, consist of the heart, arteries, veins and capillaries. The heart, which is essentially muscular, is divided into four cavities. Two of them, called auricles, receive the blood as it flows into the heart, while the other two, termed ventricles, are for the purpose of propelling the blood through the lungs and general system respectively. The vessels that carry the blood into the auricles are called veins, and the vessels through which the blood is driven onwards from the ventricles are named arteries. The right auricle contracting drives the venous or impure blood into the right ventricle through an opening guarded by a valve, to prevent a reflux movement. The right ventricle, now filled, contracts, forcing the blood through the pulmonary artery to the lungs. This artery is also guarded by valves to prevent the blood's return. It gradually divides into smaller and smaller branches, which merge into capillaries. It is in these last distributed over the interior of all the air cells (of which the lung is mainly composed), that the venous or impure blood comes in contact with atmospheric air, throws off its carbonic acid gas, its principal impurity, and absorbs oxygen, by which processes it is changed into pure, or arterial blood. The capillaries unite to form larger vessels, until finally the blood is collected in the pulmonary veins, through which it enters the left auricle, which by contraction forces it into the left ventricle, through an opening also guarded by a valve. This left ventricle contracts and drives the blood into the aorta, which by its various branches supplies every part of the body with pure arterial blood. From the aorta the blood enters the capillaries which occur in every part of the system, where it undergoes changes the reverse of those occurring in the pulmonary capillaries. It parts with its oxygen, becomes charged with carbonic acid, and, as it leaves these capillaries and enters the veins formed by their union, presents all the characters of venous blood: the veins uniting form two large trunks which empty into the right auricle, the point from which we started. The principal cause of the circulation is the contraction of the heart, though it is assisted by the elasticity and contractility of the arteries and capillaries."

[To be continued.]

"The Elm That Lives Above Our House."

Near the Log Cabin, Winter.